

What is claimed is:

1. An electronic component placement machine comprising:
  - a takeout and transfer head;
  - 5 a feeder for supplying an electronic component to said takeout and transfer head at a feeding position;
  - a board holder for holding a board onto which the electronic component is to be placed;
  - a feeder camera unit for capturing an image of the electronic
  - 10 component while in said feeder;
  - a takeout positioning device for positioning the electronic component relative to said takeout and transfer head based on a positional recognition result of the electronic component obtained by recognizing the image captured by said feeder camera unit;
  - 15 a takeout and transfer device for causing said takeout and transfer head to remove the electronic component from said feeder at the feeding position, and for flipping the electronic component while transferring the electronic component to a receiving position;
  - a placement head for receiving the electronic component from said
  - 20 takeout and transfer head at the receiving position, and for placing the electronic component onto the board;
  - a placement head camera unit for capturing an image of the electronic component, while held by said placement head at the receiving position, from beneath said placement head; and
  - 25 a placement positioning device for positioning the electronic component, while held by said placement head, relative to the board, while held by

said board holder, based on a positional recognition result of the electronic component obtained by recognizing the image captured by said placement head camera unit.

2. The electronic component placement machine according to claim 1,

5 wherein

said feeder camera unit is for capturing the image of the electronic component, while in said feeder, from above said feeder, and

said takeout and transfer head is movable to a position where capturing of the image by said feeder camera unit is not hindered.

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3. The electronic component placement machine according to claim 2,

wherein

said feeder camera unit and said placement head camera unit are disposed such that respective apertures thereof are vertically overlaid with respect to

15 each other.

4. An electronic component placement method comprising:

recognizing a position of an electronic component by capturing, via a feeder camera unit, an image of said electronic component while in a feeder;

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positioning said electronic component relative to a takeout and transfer head based on a positional recognition result of said electronic component obtained by recognizing said position of said electronic component while in said feeder;

using said takeout and transfer head to remove said electronic component from said feeder at a feeding position, and transferring said electronic

25 component to a receiving position;

using a placement head to receive said electronic component from said takeout and transfer head at said receiving position;

recognizing a position of said electronic component by capturing, via a placement head camera unit, an image of said electronic component from beneath said placement head while said electronic component is held by said placement head

positioning said electronic component, while held by said placement head, relative to a board, while held by a board holder based on a positional recognition result of said electronic component obtained by recognizing said position of said electronic component while held by said placement head;

placing said electronic component onto said board; and

prior to capturing said image of said electronic component via said placement head camera unit, moving said takeout and transfer head from said receiving position to a position where capturing of said image by said placement head camera unit is not hindered.

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5. The method according to claim 4, wherein capturing an image of said electronic component via a feeder camera unit comprises capturing said image of said electronic component via a feeder camera unit that is positioned above said feeder, and further comprising:

prior to capturing said image of said electronic component via said feeder camera unit, moving said takeout and transfer head from said feeding position to a position where capturing of said image via said feeder camera unit is not hindered.

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6. An electronic component placement machine comprising:

a takeout and transfer head;

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a placement head;

a feeder for supplying an electronic component to said takeout and transfer head at a feeding position;

a board holder for holding a board onto which the electronic component is to be placed;

5 a feeder camera unit for capturing an image of the electronic component while in said feeder;

a first positioning device for positioning the electronic component relative to said takeout and transfer head based on a positional recognition result of the electronic component obtained by recognizing the image captured by said feeder  
10 camera unit;

a takeout and transfer device for causing said takeout and transfer head to remove the electronic component from the feeding position, and for causing said takeout and transfer head to flip the electronic component while transferring the electronic component to a receiving position

15 a second positioning device for positioning the electronic component, after having been removed from the feeding position, relative to said placement head, wherein said placement head is for receiving this relatively positioned electronic component from said takeout and transfer head at the receiving position and placing the electronic component onto the board;

20 a placement head camera unit for capturing an image of the electronic component, while held by said placement head, from beneath said placement head; and

a third positioning device for positioning the electronic component, while held by said placement head, relative to the board, while held by said board  
25 holder, based on a positional recognition result of the electronic component obtained by recognizing the image captured by said placement head camera unit.

7. The electronic component placement machine according to claim 6,  
further comprising:

a placement head driving mechanism for moving said placement head,  
5 wherein said second positioning device comprises

(i) a takeout and transfer head camera unit for capturing an  
image of the electronic component, while held by said takeout and transfer  
head during removal of the electronic component from the feeding position  
and transferring of the electronic component to the receiving position, and

10 (ii) a positioning controller for positioning said placement head  
relative to the electronic component, while held by said takeout and transfer  
head at the receiving position, by controlling at least one of said takeout and  
transfer device and said placement head driving mechanism based on the  
image captured by said takeout and transfer head camera unit.

15 8. The electronic component placement machine according to claim 6,  
wherein

said second positioning device comprises a pre-centering device for  
positioning the electronic component, while held by said takeout and transfer head, to  
20 a normal position during removal of the electronic component from the feeding  
position and transferring of the electronic component to the receiving position.

9. An electronic component placement method comprising:

recognizing a position of an electronic component by capturing, via a  
25 feeder camera unit, an image of said electronic component while in a feeder;

positioning said electronic component relative to a takeout and transfer head based on a positional recognition result of said electronic component obtained by recognizing said position of said electronic component while in said feeder;

5 using a takeout and transfer head to remove said electronic component from said feeder at a feeding position, and to flip said electronic component while transferring said electronic component to a receiving position;

positioning said electronic component, after having been removed from said feeder, relative to a placement head;

10 using said placement head to receive said electronic component, after having been positioned relative to said placement head, from said takeout and transfer head at said receiving position;

recognizing a position of said electronic component by capturing, via a placement head camera unit, an image of said electronic component from beneath said placement head while said electronic component is held by said placement head,;

15 positioning said electronic component, while held by said placement head, relative to a board, while held by a board holder, based on a positional recognition result of said electronic component obtained by recognizing said position of said electronic component while held by said placement head; and

20 placing said electronic component onto said board after said electronic component has been positioned relative to said board.

10. The method according to claim 9, further comprising:

25 capturing, via a takeout and transfer head camera unit, an image of said electronic component, while held by said takeout and transfer head during removal of said electronic component from said feeder and transferring of said electronic component to said receiving position; and

positioning said placement head against said electronic component, while held by said takeout and transfer head at said receiving position, by controlling at least one of a takeout and transfer device that is to control movement of said takeout and transfer head and a placement head driving mechanism that is to control movement of said placement head, based on said image captured via said takeout and transfer head camera unit.

11. The method according to claim 9, wherein positioning said electronic component relative to said placement head comprises positioning said electronic component, while held by said takeout and transfer head during removal of said electronic component from said feeder and transferring of said electronic component to said receiving position, to a normal position by utilizing a pre-centering device.

12. An electronic component placement machine comprising:  
a takeout and transfer head;  
a placement head;  
a feeder for supplying an electronic component to said takeout and transfer head at a feeding position set to a height of a component feeding level;  
a takeout and elevating device for vertically moving said takeout and transfer head at the feeding position;  
a board holder for holding a board, onto which the electronic component is to be placed, at a board holding level, with the board holding level being higher than the component feeding level;  
a feeder camera unit for capturing an image of the electronic component while in said feeder;

a takeout positioning device for positioning the electronic component relative to said takeout and transfer head based on a positional recognition result of the electronic component obtained by recognizing the image captured by said feeder camera unit;

5                   a transfer and flipping device for causing said takeout and transfer head to remove the electronic component from said feeder at the feeding position, and for flipping the electronic component while transferring the electronic component to a transfer position which is set to a component transfer level, with the component transfer level being higher than the component feeding level;

10                  a transfer and elevating device for vertically moving said takeout and transfer head at the transfer position; and

                  a placement head transfer mechanism for moving said placement head relative to said board holder, wherein said placement head is to receive said electronic component, after having been flipped, from said takeout and transfer head at the  
15   transfer position.

13. The electronic component placement machine according to claim 12, further comprising:

                  a common driving source for driving said takeout and elevating device  
20   and said transfer and elevating device.

14. The electronic component placement machine according to claim 12, wherein said feeder camera unit includes an aperture that is provided at a position which vertically overlays the feeding position and the transfer position.

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15. An electronic component placement method comprising:



recognizing a position of an electronic component by capturing, via a feeder camera unit, an image of said electronic component while in a feeder;

positioning said electronic component relative to a takeout and transfer head based on a positional recognition result of said electronic component obtained by

5 recognizing said position of said electronic component while in said feeder;

vertically moving said takeout and transfer head at a feeding position so as to remove said electronic component from said feeder at a component feeding level;

using said takeout and transfer head to flip said electronic component  
10 while transferring said electronic component, after having been removed from said feeder, to a transfer position at a component transfer level that is higher than said component feeding level;

transferring said electronic component from said takeout and transfer head to a placement head by vertically moving said takeout and transfer head at said  
15 transfer position; and

placing said electronic component, while held by said placement head, onto a board at a board holding level that is higher than said component feeding level, by moving said placement head.

20 16. The method according to claim 15, further comprising:

driving said takeout and transfer head by the same driving source during removal of said electronic component from said feeder and during transfer of said electronic component to said transfer position.